

REMARKS

This is a full and timely response to the outstanding final Office Action mailed September 22, 2008 (Paper No. 20080910). Upon entry of this response, claims 1-16 and 18-37 are pending in the application. In this response, claims 1, 10, 21, 26, 32, and 35 are amended. Applicant respectfully requests entry of the amendments herein and reconsideration of all pending claims.

1. Rejection of Claims 1-5, 7-13, 16, and 18-19 under 35 U.S.C. §103

Claims 1-5, 7-13, 16, and 18-19 are rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Pandya* (U.S. 2004/0037319) and *Tsirigotis et al.* (U.S. 6,883,068). Applicant respectfully traverses this rejection. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest (either implicitly or explicitly) all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Independent Claim 1

Claim 1 is amended to recite "wherein the remote direct memory write command is preceded by a create request for the region and the read command is preceded by an open request for the region". Applicant respectfully submits that the proposed combination fails to teach, disclose or suggest at least this feature. Neither *Chung et al.* nor *Tsirigotis et al.* teaches remote direct memory regions. Various portions of *Pandya* discuss remote direct memory regions in general terms:

RDMA implementation also allows the system to be secure and prevent unauthorized access. This is accomplished by registering the exported

memory regions with the HBA/NIC with their access control keys along with the region IDs.

(*Pandya*, para. 0098.)

If the RDMA mechanism is used to transfer the data between the initiator and the target, appropriate region buffers identifiers, access control keys and related RDMA state data is maintained in memory on board the processor and may also be maintained in off-chip memory depending on the implementation chosen.

(*Pandya*, para. 0102.)

The RDMA controller portion of block 1708 provides various capabilities necessary for enabling remote direct memory access. It has tables that include information such as RDMA region, access keys, and virtual address translation functionality

(*Pandya*, para. 0112.)

The RDMA engine of the storage flow/RDMA controller block, 1708, of the IP processor performs protection checks for the operations requested and also provides conversion from the RDMA region identifiers to the physical or virtual address in the host space.

(*Pandya*, para. 0121.)

For RDMA buffer advertisement and registration, the RDMA region id is created and recorded along with the address translation mechanism for this region is recorded. The RDMA registration also includes the protection key for the access control and may include other fields necessary for RDMA transfer.

(*Pandya*, para. 0181.)

However, *Pandya* does not disclose a create request or an open request for a remote direct memory region. Accordingly, the proposed combination of *Chung et al.* and *Pandya* and *Tsirigotis et al.* does not teach at least the above-described features recited in claim 1.

Therefore, a *prima facie* case establishing an obviousness rejection has not been made, and the rejection should be withdrawn.

b. Independent Claim 10

Applicant respectfully submits that claim 10 are allowable for at least the reason that the proposed combination of *Chung et al.* and *Pandya* and *Tsirigotis et al.* does not disclose, teach, or suggest the feature of “storing access information to the physical addresses of the checkpoint data in the persistent memory unit when the primary process opens a memory region for the checkpoint data”. The Office Action appears to contend that this feature is disclosed by *Tsirigotis et al.* as follows:

Tsirigotis et al. teach the method for implementing a cache replacement scheme by implementing a hash table entry comprises an object identifier corresponding to an object, an index corresponding to a position within a buffer and if the object is also stored in main memory, a corresponding hash entry may also reference a memory address corresponding to an address in memory where the object is stored.
(Office Action, p. 14.)

Applicant respectfully disagrees with this characterization of *Tsirigotis et al.* It appears that the Office Action contends that the claimed "access information" corresponds to the object in *Tsirigotis et al.*, since the rejection also contends that the claimed feature "providing the **access information** to subsequent requesters" corresponds to returning a requested **object** in *Tsirigotis et al.* Therefore, Applicant first assumes (for the sake of argument) that "access information" is the same as the object in *Tsirigotis et al.* Under this assumption, it follows that "storing access information to the physical addresses" is then interpreted as "storing the object to the physical addresses". Yet *Tsirigotis et al.* does not teach that objects are stored to particular physical addresses as is recited in claim 10.

Moreover, claim 10 recites that this storage to the physical address occurs when a memory region is opened but *Tsirigotis et al.* does not discuss opening a memory region. Furthermore, claim 10 recites a specific relationship between the open and the physical address: access information is stored to the physical address of the checkpoint data when the memory region for the checkpoint data is opened. If the rejection of claim 10 is maintained in a future Office Action, the Examiner is respectfully requested to explain how the hashing scheme of *Tsirigotis et al.* relates to the claimed feature discussed above.

Finally, claim 10 also recites a specific relationship between the remote direct memory read and the access information: the read is for checkpoint data and the access information is also for the checkpoint data. *Tsirigotis et al.* does not discuss remote direct memory reads, so does not disclose the claimed relationship. Furthermore, the Office Action has not explained how the hash table entries in *Tsirigotis et al.* would be combined with the remote direct memory

reads in *Pandya* to result in the invention defined by claim 10. Therefore, a *prima facie* case establishing an obviousness rejection has not been made, and the rejection should be withdrawn.

c. Dependent Claims 2-5, 7-9, 11-13, 16, and 18-19

Since independent claims 1 and 10 are allowable, Applicant respectfully submits that claims 2-5, 7-9, 11-13, 16, and 18-19 are allowable for at least the reason that each depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicant respectfully requests that the rejection of claims 2-5, 7-9, 11-13, 16, and 18-19 be withdrawn.

2. Rejection of Claim 6 under 35 U.S.C. §103

Claim 6 is rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Pandya* (U.S. 2004/0037319) and *Tsirigotis et al.* (U.S. 6,883,068) and *Wang* (U.S. 7,082,553). The addition of Applicant respectfully traverses this rejection. *Wang* does not cure the deficiencies of *Chung et al.*, *Pandya*, and *Tsirigotis et al.* as discussed above in connection with independent claims 1 and 10. Therefore, since claim 1 is allowable, Applicant respectfully submits that claim 6 is allowable for at least the reason that it depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicant respectfully requests that the rejection of claim 6 be withdrawn.

3. Rejection of Claims 14-15 under 35 U.S.C. §103

Claims 14-15 are rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Pandya* (U.S. 2004/0037319) and *Tsirigotis et al.* (U.S. 6,883,068) and *St. Pierre et al.* (U.S. 6,141,773). Applicant respectfully traverses this rejection. The addition of *St. Pierre et al.* does not cure the deficiencies of *Chung et al.*, *Pandya*, and *Tsirigotis et al.* as discussed above in connection with independent claims 1 and 10. Therefore, since claim 10 is

allowable, Applicant respectfully submits that claims 14-15 are allowable for at least the reason that each depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicant respectfully requests that the rejection of claims 14-15 be withdrawn.

4. Rejection of Claim 20 under 35 U.S.C. §103

Claim 20 is rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Pandya* (U.S. 2004/0037319) and *Tsirigotis et al.* (U.S. 6,883,068) and *Ho et al.* (U.S. 2002/0073325). Applicant respectfully traverses this rejection. The addition of *Ho et al.* does not cure the deficiencies of *Chung et al.*, *Pandya*, and *Tsirigotis et al.* as discussed above in connection with independent claims 1 and 10. Therefore, since claim 10 is allowable, Applicant respectfully submits that claim 20 is allowable for at least the reason that it depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicant respectfully requests that the rejection of claim 20 be withdrawn.

5. Rejection of Claims 21-23 and 25-28 under 35 U.S.C. §103

Claims 21-23 and 25-28 are rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Stiffer et al.* (U.S. 6,662,263) and *Pandya* (U.S. 2004/0037319). Applicant respectfully traverses this rejection. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest (either implicitly or explicitly) all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Independent Claim 21

Applicant respectfully submits that claim 21 is allowable for at least the reason that the proposed combination of *Chung et al.* and *Stiffer et al.* and *Pandya* does not disclose, teach, or suggest the feature “authenticate requests from remote processors, and provide access information to authenticated remote processors based on address protection and translation tables in the persistent memory unit”. The Office Action acknowledges that neither *Chung et al.* nor *Stiffer et al.* teaches this feature, but appears to contend that *Pandya* teaches this feature as follows:

Pandya teaches the TCP/IP processor and engine using RDMA implementing a RDMA engine that provides various capabilities necessary for enabling remote direct memory access (paragraph 0124 lines 13-15) where the RDMA transfer may include read and write operation from a region with a certain number of bytes with a specific offset (paragraph 0124 lines 80-86). The RDMA engine also provided tables that include information like RDMA region and the access keys, and virtual address translation functionality (paragraph 0124 lines 15-20). The RDMA commands may also go through protection key look-up and address translation as per the RDMA initialization (paragraph 0124 lines 115-118).
(Office Action, p. 22.)

Applicant respectfully disagrees with this characterization of *Pandya*. *Pandya* does teach “virtual address translation functionality”, but a general statement that RDMA tables include access keys and a brief mention of the phrase “protection key look-up” is not the same as the specific features recited in claim 21, namely “authenticate requests from remote processors”. Furthermore, even assuming (for the sake of argument) that protection key look-up is the same as authenticating requests, this look-up is not the same as “provide access information to authenticated remote processors” as recited in claim 21. Accordingly, the proposed combination of *Chung et al.* and *Stiffer et al.* and *Pandya* does not teach at least the above-described features recited in claim 21. Therefore, a *prima facie* case establishing an obviousness rejection has not been made, and the rejection should be withdrawn.

b. Independent Claim 26

Applicant respectfully submits that claim 26 is allowable for at least the reason that the proposed combination of *Chung et al.* and *Stiffer et al.* and *Pandya* does not disclose, teach, or suggest the feature “means for receiving access information to physical addresses of checkpoint data in the persistent memory from the persistent memory unit”. The Office Action acknowledges that neither *Chung et al.* nor *Stiffer et al.* teaches this feature, but appears to contend that *Pandya* teaches this feature as follows:

Pandya teaches the TCP/IP processor and engine using RDMA implementing a RDMA engine that provides various capabilities necessary for enabling remote direct memory access (paragraph 0124 lines 13-15) where the RDMA transfer may include read and write operation from a region with a certain number of bytes with a specific offset (paragraph 0124 lines 80-86). The RDMA engine also provided tables that include information like RDMA region and the access keys, and virtual address translation functionality (paragraph 0124 lines 15-20). The RDMA commands may also go through protection key look-up and address translation as per the RDMA initialization (paragraph 0124 lines 115-118).
(Office Action, pp. 25-26.)

Applicant respectfully disagrees with this characterization of *Pandya*. Applicant first assumes (for the sake of argument) that “virtual address translation functionality” implies translation to physical addresses. Applicant next assumes (for the sake of argument) that access keys are the same as “access information”. Even so, a general statement that RDMA tables include access keys and a brief mention of the phrase “protection key look-up” is not the same as the specific features recited in claim 26, namely “receiving access information for physical addresses”. Furthermore, even assuming (for the sake of argument) that protection key look-up uses “access information for physical addresses”, using this information in a look-up is not the same as “receiving access information” as recited in claim 26. Accordingly, the proposed combination of *Chung et al.* and *Stiffer et al.* and *Pandya* does not teach at least the above-described features recited in claim 26. Therefore, a *prima facie* case establishing an obviousness rejection has not been made, and the rejection should be withdrawn.

c. Dependent Claims 22-23, 25, and 27-28

Since independent claims 21 and 26 are allowable, Applicant respectfully submits that claims 22-23, 25, and 27-28 are allowable for at least the reason that each depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicant respectfully requests that the rejection of claims 22-23, 25, and 27-28 be withdrawn.

6. Rejection of Claim 24 under 35 U.S.C. §103

Claim 24 is rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Stiffer et al.* (U.S. 6,662,263) and *Pandya* (U.S. 2004/0037319) and *Wang* (U.S. 7,082,553). Applicant respectfully traverses this rejection. The addition of *Wang* does not cure the deficiencies of *Chung et al.*, *Pandya*, and *Tsirigotis et al.* as discussed above in connection with independent claims 21 and 26. Therefore, since claim 23 is allowable, Applicant respectfully submits that claim 24 is allowable for at least the reason that it depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Applicant respectfully requests that the rejection of claim 24 be withdrawn.

7. Rejection of Claims 29-31 under 35 U.S.C. §103

Claims 29-31 are rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Stiffer et al.* (U.S. 6,662,263) and *Pandya* (U.S. 2004/0037319) and *St. Pierre et al.* (U.S. 6,141,773). Applicant respectfully traverses this rejection. The addition of *St. Pierre et al.* does not cure the deficiencies of *Chung et al.*, *Pandya*, and *Tsirigotis et al.* as discussed above in connection with independent claims 21 and 26. Therefore, since claim 26 is allowable, Applicant respectfully submits that claims 29-31 are allowable for at least the reason that each depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596,

1598 (Fed. Cir. 1988). Applicant respectfully requests that the rejection of claims 29-31 be withdrawn.

8. Rejection of Claims 32-33 and 35-37 under 35 U.S.C. §103

Claims 32-33 and 35-37 are rejected under §103(a) as allegedly obvious over *Chung et al.* (U.S. 6,195,760) in view of *Pandya* (U.S. 2004/0037319). Applicant respectfully traverses this rejection. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest (either implicitly or explicitly) all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Independent Claims 32 and 35

Applicant respectfully submits that claims 32 and 35 are allowable for at least the reason that the proposed combination of *Chung et al.* in view of *Pandya* does not disclose, teach, or suggest the feature of "receiving access information to physical addresses of checkpoint data in the persistent memory from the persistent memory unit". The Office Action acknowledges that *Chung et al.* does not teach this feature, but appears to contend that *Pandya* teaches this features as follows:

Pandya teaches the TCP/IP processor and engine using RDMA implementing a RDMA engine that provides various capabilities necessary for enabling remote direct memory access (paragraph 0124 lines 13-15) where the RDMA transfer may include read and write operation from a region with a certain number of bytes with a specific offset (paragraph 0124 lines 80-86). The RDMA engine also provided tables that include information like RDMA region and the access keys, and virtual address translation functionality (paragraph 0124 lines 15-20). The RDMA commands may also go through protection key look-up and address translation as per the RDMA initialization (paragraph 0124 lines 115-118).
(Office Action, p 30 and pp.31-32.)

Applicant respectfully disagrees with this characterization of *Pandya*. Applicant first assumes (for the sake of argument) that “virtual address translation functionality” implies translation to physical addresses. Applicant next assumes (for the sake of argument) that access keys are the same as “access information”. Even so, a general statement that RDMA tables include access keys and a brief mention of the phrase “protection key look-up” is not the same as the specific features recited in claim 26, namely “receiving access information for physical addresses”. Furthermore, even assuming (for the sake of argument) that protection key look-up uses “access information for physical addresses”, using this information in a look-up is not the same as “receiving access information” as recited in claim 26. Accordingly, the proposed combination of *Chung et al.* in view of *Pandya* does not teach at least the above-described features recited in claim 26. Therefore, a *prima facie* case establishing an obviousness rejection has not been made, and the rejection should be withdrawn.

b. Dependent Claims 33 and 36-37

Since claims 32 and 35 are allowable, Applicant respectfully submits that claims 33 and 36-37 are allowable for at least the reason that each depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicant respectfully requests that the rejection of claims 33 and 36-37 be withdrawn.

CONCLUSION

Applicant respectfully requests that all outstanding objections and rejections be withdrawn and that this application and presently pending claims 1-16 and 18-37 be allowed to issue. Any statements in the Office Action that are not explicitly addressed herein are not intended to be admitted. In addition, any and all findings of inherency are traversed as not having been shown to be necessarily present. Furthermore, any and all findings of well-known art and official notice, or statements interpreted similarly, should not be considered well known since the Office Action does not include specific factual findings predicated on sound technical and scientific reasoning to support such conclusions. If the Examiner has any questions or comments regarding Applicant's response, the Examiner is encouraged to telephone Applicant's undersigned counsel.

Respectfully submitted,

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